Missouri Conservationist

VOLUME 78, ISSUE 6, JUNE 2017 • SERVING NATURE & YOU

[NOTE TO OUR READERS]

The Power of Potlucks

What is it about a potluck-style meal that remains a staple of our culture, especially in summer, despite a world of fast food and fast pace? There's something to be said for breaking bread together and sharing a favorite family dish or a funny story that brings a community together around a table. We are encouraged to slow down, savor the moment, and enjoy fellowship together. And it never fails that individuals bringing what they have to share collectively creates a feast for all who come.

I was fortunate enough to attend a brunch potluck a few weeks ago at the Conservation Department's Anita B. Gorman Discovery Center in downtown Kansas City. This neighborhood event, hosted by Missouri State Senator S. Kiki Curls, was designed to build relationships between the department and community leaders in the University of Missouri–Kansas City's Center for Neighborhoods, which serves as a catalyst for addressing challenges in city neighborhoods. What transpired was an inspiring conversation. We heard from people about about conservation and how we can build upon our efforts in the urban core. How do we make a difference together?

As I was headed home from this incredible community event, my mind reflected back to our 80-year history of conservation, the voices that have made a difference, and all the changes we've seen along the way. The list of changes is long — from the recovery of wildlife populations once in drastic decline to now having access to nearly 1,000 conservation areas, comprising nearly 1 million acres of public land, to explore. And yet, we also recognize that our society is increasingly urbanized and diverse, and the time spent outdoors for many is significantly decreasing. But we know that great opportunities come out of complex challenges, including in conservation.

What hasn't changed much in the past 80 years is the importance of people and partnerships (see *More Wildlife For All*, Page 10). We must continue to gather together for a common purpose and give what we can of ourselves for the larger cause of conservation, knowing the whole is always greater than the sum of our individual efforts. It's amazing the powerful lessons you can learn from a potluck!

Sara Parker Pauley

—Sara Parker Pauley, director

80 Years of Conservation

Throughout this issue you'll find highlights of the department's 80-year history. Everything we do today builds on our past, pushing us to take care of our future. Partnerships are ingrained in our conservation history. With the support of citizen groups like the Conservation Federation of Missouri, the department brought wildlife back to Missouri, as urged in this 1936 campaign poster.

FEATURES

Cover: A white-tailed deer and her fawn. To learn how landowners are working together for wildlife, read *More Wildlife For All*, starting on Page 10. Photograph by Noppadol Paothong
500mm lens • f/5.6 • 1/400 sec • ISO 800

DEPARTMENTS

WHAT IS IT?

Our photographers have been busy exploring the intricacies of outdoor Missouri. See if you can guess this month's natural wonder. The answer is revealed on Page 7.

Tower Grove Park

My husband and I enjoyed the recent publication that featured photos of birds taken in Tower Grove Park, St. Louis [March; Page 16]. I grew up in St. Louis and my husband moved to St. Louis in 1950. We met and married in St. Louis and frequented the park for picnics, special celebrations, and holidays. Later, as our two children were growing up, kite flying was a yearly activity at the park. It's a beautiful park.

The Lockharts, Fulton

I live in Kansas, but we spend a great deal of time at Lake of the Ozarks in Missouri. Every month I look forward to reading the *Missouri Conservationist*. *Tower Grove Park* by Danny Brown is outstanding! I am a birder, so it naturally caught my eyes right away.

I truly enjoyed how Danny shared his wildlife photography project at Tower Grove Park with us. Not only is Danny Brown a terrific wildlife photographer, he is also a wonderful writer. I felt I was right there with him as he photographed birds during the four seasons. I look forward to a future trip to St. Louis and Tower Grove Park, so I can see this historic landmark and these beautiful birds myself.

Ann Tanner, Leawood, Kansas

Forgot the Duckweed

You missed a great opportunity to get two for the price of one in the April issue's *What Is It?* [Page 8].

The correct answer is American bullfrog and duckweed. Thanks for this great shot of both. Most people consider duckweed as just another element of pond scum without ever considering the value it has in water habitats. Not to mention it is beautiful.

Sue Hollis, West Plains

In the April *What Is It?* photo, I was probably not the only botanist reader who was chagrined that the American bullfrog got all the credit while the lowly *Wolffia*, which dominated the photo, was not even mentioned. While bullfrogs are interesting and good eating, the *Wolffia* plant, also known as duckweed or watermeal, is probably even more interesting and also edible. It is one of the smallest flowering plants on earth and has about the same amount of protein as soybeans, about 40 percent when dried. It is also one of the few flowering plants without roots and the flower contains a single pistil and a single stamen. These characteristics make it pretty unique in the plant world. They are also found in every county in Missouri, so they are common enough that most of us have probably seen them at one time or another.

Bob Warrick, Gainesville

Nature Knights

Regarding the two letters recently about the Nature Knights program [February and April; Page 2], I believe my dad, Townsend Godsey, was the man responsible for starting the program. He was a firm believer in the importance of educating people about their environment and the importance of conservation. I can remember how pleased my brother, sister, and I were when he was able to get Walt Disney to do the border illustrations for the certificates.

Dad and my mother, Helen, who was also involved, would have been so pleased to know of the good memories these two letter writers

have of the program. My thanks to them for sharing those memories.

Katye Godsey Elsea, Marshall

Editors' note: Townsend Godsey started the first formal youth education program of the Conservation Commission in the spring of 1939. The Nature Knights program was structured to let youngsters progress from pages to squires and knights as they achieved conservation goals. Walt Disney, who grew up in Marceline, designed the certificates (pictured above) for the program, which were instant hits with the young conservationists.

Reader Photo

A Frog Hops Into a Buffet

Will Simard captured this photo of a gray treefrog on a corn plant in his small garden in St. Charles. "I have been dealing with aphids in my garden," said Simard. "Within the last few days, I'd noticed a decline (of the pests). I'd assumed it was due to rain and a few ladybugs." However, when Simard went out to his garden one evening after work, he noticed the frog "enjoying an aphid buffet on my corn." Simard says he hates using pesticides and prefers natural alternatives. "This little guy seems to be doing the job just fine."

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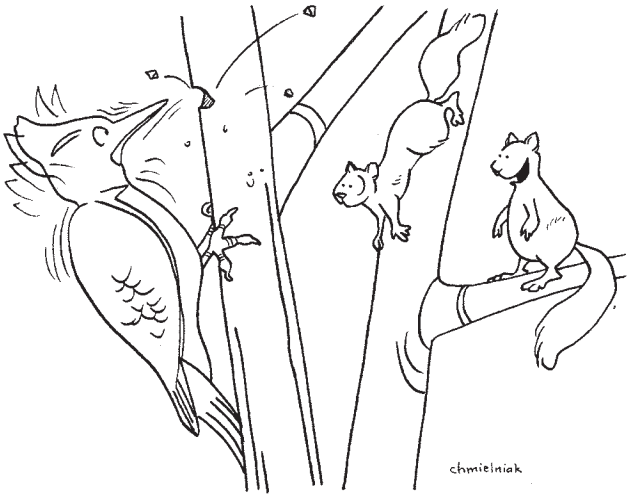

"He learned everything he knows from the School of Hard Knocks!"

Agent Notes

Summertime Frogging

WHEN MY FRIENDS and I were growing up in Cape Girardeau County, it was almost a given that if we were not at school or work, we were fishing. Whether fishing local farm ponds or bow fishing at Diversion Channel, we were always outdoors doing something. One of my favorite summertime activities was frog gigging. When the dog days of summer keep most people inside during the day, frog season gives you the opportunity to get out after dark and have some fun while avoiding the summer heat.

During Missouri's frog season, open sunset June 30 through Oct. 31, you can harvest both bullfrogs and green frogs using a wide variety of legal hunting methods. See *Grab Your Frogging Gear* on Page 6 for details. With a daily limit of eight frogs per person, make sure you have the correct permit for the method you are using.

Frogs are generally more plentiful in newer or very old ponds. For a successful frogging trip, focus your efforts on brushy, weedy edges.

For more information, visit **short.mdc.mo.gov/ZZm**. Frog gigging season rules and regulations can be found in the *Wildlife Code of Missouri* sections 3CSR 10-6.615 and 3CSR 10-7.445.

Ben Stratton is the conservation agent for Cape Girardeau County. To contact the agent for your county, phone your regional conservation office listed on Page 3.

HUNTING & FISHING CALENDAR

FISHING	OPEN	CLOSE
Black Bass		
Impounded waters and most streams north of the Missouri River	All year	None
Most streams south of the Missouri River	05/27/17	02/28/18
Bullfrogs and Green Frogs	06/30/17 *at sunset*	10/31/17
Nongame Fish Gigging		
Impounded Waters		
sunrise to sunset	02/01/17	09/14/17
Streams and Impounded Waters		
sunrise to midnight	09/15/17	01/31/18
Paddlefish		
Mississippi River	09/15/17	12/15/17
Trout Parks		
Catch-and-Keep	03/01/17	10/31/17
Catch-and-Release	11/10/17	02/12/18

HUNTING	OPEN	CLOSE
Bullfrogs and Green Frogs	06/30/17 *at sunset*	10/31/17
Coyote (restrictions apply during April, spring turkey season, and firearms deer season)	All year	None
Deer		
Archery	09/15/17	11/10/17
	11/22/17	01/15/18
Firearms		
Early Youth Portion	10/28/17	10/29/17
November Portion	11/11/17	11/21/17
Late Youth Portion	11/24/17	11/26/17
Antlerless Portion (open areas only)	12/01/17	12/03/17
Alternative Methods Portion	12/23/17	01/02/18
Groundhog (woodchuck)	05/08/17	12/15/17
Pheasant		
Youth	10/28/17	10/29/17
Regular	11/01/17	01/15/18
Quail		
Youth	10/28/17	10/29/17
Regular	11/01/17	01/15/18
Rabbit	10/01/17	02/15/18
Squirrel	05/27/17	02/15/18
Turkey		
Archery	09/15/17	11/10/17
	11/22/17	01/15/18
Firearms		
Fall	10/01/17	10/31/17
Waterfowl	see the *Waterfowl Hunting Digest* or **short.mdc.mo.gov/ZZx**	

For complete information about seasons, limits, methods, and restrictions, consult the *Wildlife Code of Missouri* and the current summaries of *Missouri Hunting and Trapping Regulations* and *Missouri Fishing Regulations*, *The Spring Turkey Hunting Regulations and Information*, the *Fall Deer & Turkey Hunting Regulations and Information*, the *Waterfowl Hunting Digest*, and the *Migratory Bird Hunting Digest*. For more information, visit **short.mdc.mo.gov/ZZf** or permit vendors.

Ask MDC

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Phone: 573-522-4115, ext. 3848 **Email:** AskMDC@mdc.mo.gov

Lady slipper

JIM RATHERT

What is this plant?

This beautiful perennial orchid is a lady slipper (*Cypripedium calceolus*). Blooming between April and June, these showy orchids are scattered nearly statewide, with the exception of the Bootheel. Seen in colonies, lady slippers have three long, twisted "flags" — an upright sepal and two lateral petals. The bright lip, or "yellow slipper," is a third petal.

Two varieties exist. The small yellow lady's slipper features reddish-purple to brown lateral petals, while the large yellow lady's slipper has yellowish-green ones.

Thirty-eight orchid species are found in Missouri, and all but one of those are native. Unfortunately, of the 37 species, 13 are considered rare or endangered. If you see a wild orchid, please don't try to transplant it because it will not survive. Enjoy them in their natural habitat.

Why does the Conservation Department conduct controlled burns? Aren't fires bad for forests?

Controlled burns can be extremely beneficial. Fire is not used in forest areas where it might damage potentially valuable timber, but it is an important tool to create and maintain a variety of open savanna, woodland, and grassland habitats.

For example, savannas — the grassy transition zones between prairies and woods — need periodic fire to thrive. Without it, they'll gradually be taken over by undesirable trees and shrubs. In oak savannas and woodlands, fire keeps the tree canopy open, creating habitat for sun-loving prairie plants, shade-tolerant woodland species, and other flora unique to those areas.

My children love to feed bread to the ducks and geese, but I recently learned it isn't healthy for them. Is this true?

Wildlife biologists do not condone feeding waterfowl. The practice of feeding bread, pastries, cookies, and other various types of human food can cause significant health problems for ducks and geese. Processed foods provide little or no nutritional value and may actually contribute to starvation and deformities like angel wing in Canada geese, rendering them flightless. Moldy foods can impact their health just as it does in humans. Ducks and geese are far better off building their reserves by moving from location to location and eating a natural diet.

Instead of feeding human food to waterfowl, we recommend enjoying birds through backyard birdfeeders, using black-oil sunflower seeds, white millet, Niger thistle, and unspoiled suet — food sources that mimic their natural diet. You can read more at **short.mdc.mo.gov/Zik**.

Hummingbird "nectar" — one part white sugar to four parts water — is another way to attract and feed birds. This sugar solution provides the energy hummingbirds need to seek out natural flower nectar and insects.

NEWS & EVENTS

by Joe Jerek

Grab Your Frogging Gear!

Frogging is a great way to introduce kids and adults to the outdoors. Frogging season begins June 30 at sunset and ends Oct. 31. Bullfrogs and green frogs are legal game. Bullfrogs are larger and therefore more sought-after.

The daily limit is eight frogs of both species combined and the possession limit is 16 frogs of both species combined. Only the daily limit may be possessed on the waters or banks where limits apply. Daily limits end at midnight, so froggers who catch their daily limits before midnight and then want to return for more frogging after midnight must remove the daily limit of previously caught frogs from the waters or banks before returning for more.

Frogs can be pursued with either a fishing permit or a small-game hunting permit. Children under the age of 16 and Missouri residents 65 years of age or older are not required to have a permit. Those with a fishing permit may take frogs by hand, hand net, atlatl, gig, bow, trotline, throw line, limbline, bank line, jug line, snagging, snaring, grabbing, or pole and line. With a small game hunting permit, you may harvest frogs using a .22-caliber or smaller rimfire rifle or pistol, pellet gun, atlatl, bow, crossbow, or by hand or hand net. The use of an artificial light is permitted when frogging.

For more information about frog hunting, including how to get started and tasty recipes to try, visit **short.mdc.mo.gov/ZZm**.

Lend Your Voice and Celebrate 80 Years of Conservation

In honor of our 80th anniversary, the Conservation Department will be hosting open houses around the state, starting this summer and into the fall, to celebrate what makes conservation so great in Missouri — citizens like you who care deeply about conservation! Director Sara Parker Pauley will be in attendance at the free open houses, as well as Conservation Commissioners, to share insights on top conservation priorities and challenges on the horizon. Attendees will also have the chance to give direct feedback on the department's regulations, infrastructure, strategic priorities, and key conservation issues on a local and statewide level.

Southeast Region: Aug. 8, 2017, 6–8 p.m.
Cape Girardeau Conservation Nature Center
2289 County Park Drive,
Cape Girardeau, MO 63701

Central Region: Aug. 10, 2017, 6–8 p.m.
Runge Conservation Nature Center
330 Commerce Drive, Jefferson City, MO 65109

Northeast Region: Aug. 14, 2017, 6–8 p.m.
MDC Northeast Regional Office
3500 S. Baltimore, Kirksville, MO 63501

St. Louis Region: Sept. 7, 2017, 6–8 p.m.
Powder Valley Conservation Nature Center
11715 Cragwold Road, Kirkwood, MO 63122

Northwest Region: Sept. 26, 2017, 6–8 p.m.
Missouri Western State University
Kemper Recital Hall
(located in the Spratt Hall 101 Building)
4525 Downs Drive, St. Joseph, MO 64507

Southwest Region: Oct. 10, 6–8 p.m.
Springfield Conservation Nature Center
4601 S. Nature Center Way,
Springfield, MO 65804

Ozark Region: Oct. 12, 6–8 p.m.
Twin Pines Conservation Education Center
20086 Highway 60, Winona, MO 65588

Kansas City Region: Oct. 26, 2017, 6–8 p.m.
The Anita B. Gorman Conservation
Discovery Center
4750 Troost Ave., Kansas City, MO 64110

DAVID STONNER

Come talk with department staff about fish, forest, and wildlife efforts and share your thoughts about the future of conservation in Missouri. No registration is required for the open houses. For more information about the events, contact Michele Baumer, public involvement coordinator, at 573-522-4115, ext. 3350, or **Michele.Baumer@mdc.mo.gov**.

Get Hooked With Free Fishing Days

Fishing is a perfect low-stress, low-impact activity that keeps you moving for hours, plus being in the outdoors has been shown to boost your brain power. Want to give it a try? Get hooked on fishing with our Free Fishing Days June 10 and 11. Anyone can fish in the Show-Me State without a fishing permit, trout permit, or trout park daily tag. Normal regulations, such as limits on size and number of fish an angler may keep, remain in effect. Special permits may still be required at some county, city, or private fishing areas.

Our free MO Fishing mobile app helps anglers find the best places to fish in Missouri, access regulation information, identify fish by species, and more. Anglers can also buy, store, and show fishing permits right on their mobile devices.

For information on Missouri fishing regulations, fish identification, and more, get a copy of our *2017 Summary of Missouri Fishing Regulations* where permits are sold or online at **huntfish.mdc.mo.gov/fishing**.

Eighty years ago, fish were scarce in many sections of Missouri's rivers and streams because of runoff from little-regulated, clear-cut logging. Through conservation efforts over the past eight decades, Missouri has healthy populations of about 200 fish species with over 20 game fish for the state's more than 1.1 million anglers. Conservation efforts continue with our fish hatcheries stocking more than 7 million fish for anglers and others each year. Learn more at short.mdc.mo.gov/ZoL.

DID YOU KNOW?

Conservation makes Missouri a great place to hunt and fish.

Providing Access to Hunting, Fishing, and Outdoor Recreation Opportunities for 80 Years

- MDC established its conservation area program to provide permanent fish and wildlife habitat and public outdoor recreation opportunities.
- Shortly after its creation in 1937, MDC began purchasing land for conservation areas and pursuing cooperative management with local parks and community lakes. Today, MDC owns or cooperatively manages nearly 1,000 areas statewide.
- Conservation areas can include a number of features such as boating accesses, shooting ranges, nature and interpretive centers, natural areas, and more.
- Some areas, like nature centers and hatcheries, have staffed visitor centers, while others provide a wilder outdoor experience with little more than parking areas and access trails.
- *Find Places to Go* is a searchable online atlas that lets you browse every conservation area in the state, so you can know the area's recreation opportunities, regulations, hours of operation, facilities, and directions before you visit. Direct your browser to **mdc.mo.gov/atlas**.
  - » Sort areas by activities like hunting or fishing; by facility type like boat ramps or hunting blinds; by natural feature like fishing lake or prairie; or by other options such as disabled accessibility, designated trails, and shooting ranges.

WHAT IS IT?

Common Eastern Bumblebee

Bombus spp.

Common eastern bumblebees are large, black-and-yellow, fuzzy bees that measure about one-half to 1 inch in length. At least six species of bumblebees occur in Missouri. During the day, they forage among flowers, like purple coneflower shown here, for nectar and pollen. Adults eat nectar, while pollen and honey are fed to the young. Nests, usually built in rodent burrows, brush piles, trash heaps, and birdhouses, rarely have more than 100 workers at a time. In the spring, a single fertilized female, or queen, finds a suitable nest site and builds in it a large, irregular cell of wax and pollen and lays several eggs. Young will become workers and take over the pollen and nectar collecting, feeding additional young, and other nest duties. Later in the season, the queen lays eggs for queens and males, or drones. In the fall, these leave the colony to find mates. Only young queens survive the winter by hibernating in the ground. These fertilized queens begin a new colony the next spring. —*photograph by Noppadol Paothong*

Director Sara Parker Pauley and Commissioner Dave Murphy sat with Bill Crawford at his home in Columbia.

Fireside Chat With Bill Crawford

80 YEARS OF CONSERVATION

BY SARA PARKER PAULEY, DIRECTOR

There is something mystical about conversations that occur fireside, be it a fireplace or a campfire, that brings out the stories and storyteller in all of us. I witnessed it again this past February when, on a blustery day, Conservation Commissioner Dave Murphy and I had the great fortune to spend several hours chatting fireside with conservation giant and pioneer Bill T. Crawford. It was an unforgettable experience.

For those of us who know the Missouri conservation story well, we know there is only one living person from that historic meeting that started it all, and it is 99-year-old Crawford. He was the youngest attendee, only 17 years old at the time, when he accompanied his father to the September 1935 meeting at the Tiger Hotel in Columbia. More than 100 conservation leaders and sportsmen attended the meeting with one goal in mind — to stop the downward spiral and exploitation of wildlife in Missouri.

Learning From the Past

It was a bleak story for conservation in the early 1930s. Missouri forests were decimated, wildlife was exploited by wagon loads to sell in markets, and streams carried more gravel than fish. Wildlife was at an all-time low with less than 2,000 deer and 3,500 wild turkeys. But, thankfully, the story didn't end there. Missouri citizens, especially sportsmen, came together at the Tiger Hotel to iron out a long-term solution. Crawford was there, and he is the final witness to the proceedings.

"My dad was one of the best quail hunters in town, so they picked solid people that liked the outdoors and were substantial citizens to come to the Tiger Hotel," recounted Crawford. "I had never been in the Tiger Hotel before, but they had the best meeting room, and there were so many ideas there."

The meeting hall echoed with the bold conversations that ensued, including direction to draft a constitutional amendment to form a four-person, nonpartisan Conservation Commission to restore Missouri's wildlife and forests. Crawford witnessed not only the proceedings, but he was there, too, along with many others, carrying petitions for the 1936 vote to establish the Conservation Commission.

"Dad had about 3,000 posters to put up, so we bought a 1935 Chevrolet car and drove all over the county putting up posters on telephone poles and post offices," said Crawford. "We were early birds and there to help the cause."

The group's hard work paid off in spades — Missouri citizens overwhelmingly supported Amendment 4, establishing the Missouri Department of Conservation.

But Crawford's conservation story was just getting started. He took his love of wildlife and the outdoors, eventually studying biology at the University of Missouri-Columbia, and joined the department in 1942 to enhance the role of science in Missouri's wildlife management efforts. It was pioneering work, starting from the ground up.

80 Years of Conservation

Bill Crawford was instrumental in developing the Natural Areas System, established in 1977, which became a model for the protection of original landscapes. To hear Crawford retell his role in Missouri's conservation history, watch his interview with our partners at the Conservation Federation of Missouri at youtu.be/FM8Bk2MG1g4.

FIRESIDE CHAT: KEVIN MUENKS; BILL CRAWFORD: MDC FILE PHOTO

"Not much was known about the habitats of Missouri. We surveyed 20 square miles at a time to sample soil in 38 different areas, and we talked to a lot of farmers. When we talked about conservation, people could not even pronounce it. They called it conversation," he laughed.

Crawford would eventually be in charge of the department biologists as the first wildlife research chief, a role he held until his retirement in 1983. Crawford is also credited with creating the Missouri Natural Areas Program and co-founding the Missouri Prairie Foundation. Crawford was awarded the Master Conservationist Award in 2010, which is the highest honor the department can bestow on citizens who have accomplished exemplary conservation work.

Looking to the Future

While Crawford is an invaluable connection to our past, he also embodies our conservation future. As I look ahead to what's on the horizon, I see citizens still gathering in the name of conservation to make a difference. I see science still at the heart of our mission. I see partnerships still thriving. I also see how the forward-thinking ideas of concerned citizens years ago gifted us with the foundation to successfully conserve the fish, forest, and wildlife resources today.

It is a much brighter picture in 2017. We have abundant wildlife, thriving state forests, healthy wetlands, wildlife and aquatic research, nearly 1,000 conservation areas, stream accesses, a robust hatchery system, effective wildlife law enforcement, and innovative conservation education programs. While we also have many big conservation challenges ahead, those ideas first voiced at the Tiger Hotel 80 years ago give us the solid foundation to tackle them head-on. I'm thankful we still have conservation pioneers like Bill Crawford to share our story and cheer us on. ▲

Timeline of Conservation Events

Celebrating 80 years of serving nature and you!

Sept. 10, 1935
Nearly 100 sportsmen meet at the Tiger Hotel in Columbia to discuss depleting wildlife resources in Missouri. The Conservation Federation of Missouri is established.

Nov. 3, 1936
Missouri voters approve Amendment 4 by a margin of 71-29 percent, creating a state nonpartisan conservation agency with exclusive authority over fish, forests, and wildlife.

July 1, 1937
The constitutional amendment creating the Missouri Conservation Commission takes effect.

1938
Deer and turkey seasons are closed statewide due to limited numbers. Only about 2,500 turkeys and 1,800 deer remained in the state.

July 1938
First issue of the *Missouri Conservationist* is published.

1944
A bucks-only deer season reopens in 20 counties.

1946
The department begins intensive efforts to restore more than 112,000 wetland acres.

First bow season opens in Crawford County for three days. Eighty archers participated. It wasn't until 1952 that a deer would be harvested with a bow.

August 1947
A special-use permit is signed with the Forest Service, acquiring full use of the state forest nursery. Today more than 3 million tree seedlings are produced each year.

1957
Missouri's first formal hunter safety training begins as a voluntary course.

1959
Deer season reopens in all Missouri counties.

Shepherd of the Hills Hatchery begins operations.

1960
Missouri's spring turkey season reopens across the state.

1969
The first community forester is hired in Kansas City to provide assistance on community tree management.

Urban fishing program begins in St. Louis City park lakes, the first in the nation.

1973
The first staffed range, August A. Busch Shooting Range, opens in St. Louis.

1975
Fall archery season for turkey reopens.

1976
Missouri voters approve the Design for Conservation sales tax. The one-eighth of 1 percent sales tax provides dedicated funding for the conservation of fish, forests, and wildlife.

1978
First fall firearms season for turkey.

1982
The first conservation nature center, Burr Oak Woods in Blue Springs, is built.

1987
The Conservation Commission approves a mandatory hunter education requirement for all hunters during the firearms season beginning in 1988.

1989
Missouri Stream Team program is established

1990
Rural firefighter property center is acquired.

2001
First youth-only, two-day spring turkey season and youth-only portion of the firearms deer hunting season are established.

2006
The department develops Discover Nature Schools program, free science-based curriculum materials for grades pre-school–12.

2011
Elk are reintroduced in Carter, Shannon, and Reynolds counties. Wild elk, formerly abundant in the state, had not been seen in Missouri since 1865.

Bobwhite quail have a better chance of surviving harsh weather on land with landowner cooperatives. See details on Page 15.

More Wildlife For All

When landowners work together, everyone wins

BY BILL GRAHAM | PHOTOGRAPHS BY NOPPADOL PAOTHONG

A bobwhite quail whistling on a June morning cares not if his call passes to a neighbor's farm, only that another bobwhite hears and answers, "bob, bobwhite." Deer and turkeys pay little heed to property lines, too, as they hop over fences seeking food, shelter, and to mingle with others of their species. Their boundaries are defined where timber, shrubs, or grasses begin and end.

> *"We can't control where the birds go. But we can control having a place for them to go."*
>
> Joe Pipta,
> Bee Ridge co-op member

Knox County farmers (left to right) Joe Pipta, Corey Huchteman, and Kevin Strange use several habitat management practices to boost wildlife in the Bee Ridge Quail Focus Area.

That's why MDC helped Kevin Strange and his farm neighbors, including Joe Pipta form the Bee Ridge Quail Focus Area in Knox County. A single farmer planting quail-friendly cover helps wildlife. But when neighboring farm owners share expertise, equipment, and helping hands to implement wildlife-friendly practices alongside crops and pastures over broad areas, their return is more wildlife for all.

"Having more people doing things to enhance everything is what benefits us a lot," Pipta said. "Our farms are connected, it's a contiguous area. We can't control where the birds go. But we can control having a place for them to go. Give them a place to go with food and cover, and they'll be there."

Farmers and property owners across Missouri have formed dozens of formal or informal cooperatives to boost wildlife. Some participants seek better hunting. Others don't hunt but plant native grasses and help neighbors with prescribed burns to improve habitat because they enjoy watching wildlife. Some co-ops hold annual fish-fry community gatherings and sponsor youth hunts. For others, participation may simply be sharing ideas over café coffee or disking a field edge for a neighbor. Their efforts are important because 93 percent of the state's acreage is privately owned, and Missourians value nature.

Making Management Work for Wildlife

Much of the 12,000 acres within the Bee Ridge co-op's rolling hills is planted in corn and soybeans, or it's used as pasture or hay fields. But since forming the co-op a decade ago, 18 landowners have also provided 1,300 acres of quality habitat for wildlife to find food, raise young, and endure freezing winters or blistering summers. About 250 acres are in cover strips that border crop fields. The largest tracts are fields converted from crops into grasses and forbs through

80 Years of Conservation

Ninety-three percent of Missouri land is privately owned. To support landowners' efforts to manage for fish, forests, and wildlife, the department established the Private Land Services division in 2000. MDC remains the only U.S. state fish and wildlife agency with a full division dedicated to helping landowners.

the U.S. Department of Agriculture's Conservation Reserve Program (USDA/CRP).

"This is a way of giving back a little bit to wildlife," said Pipta, who enjoys hunting on his farm.

For their efforts, Bee Ridge farmers are seeing more quail and other wildlife. In 2008, they began annual fall quail covey counts. They set up listening posts to locate calling coveys inside and outside the co-op boundaries. During the first years, they averaged one to two coveys more per listening post inside the focus area compared to sites outside. Then a 20-inch snowfall in February 2011 caused quail numbers to plummet for a few years. Quail numbers inside the focus area with habitat improvements rebounded gradually, back up in 2016 to earlier highs with an average of 3.3 coveys per listening post. But outside the focus area, quail have not rebounded to earlier levels. In 2016, the count lingered low at one covey per listening post.

"We're seeing several more coveys," Pipta said of the focus area. "We're also seeing a lot more songbirds and rabbits."

MDC staffers advise co-ops on habitat management strategies. They also help landowners use cost-share or grant funds from various state, federal, or private conservation programs that make habitat improvements affordable.

Strange and neighbors use payments from federal conservation programs such as CRP to offset practice costs. A practice through CRP called Habitat Buffers for Upland Birds, also known as CP33, helps pay for planting native grasses and wildflowers in cover strips 30 to 120 feet wide in eligible fields. Those strips also help with soil and water conservation. Often, cover strips are planted in marginally productive areas for crops due to soil conditions, drainage, or shade from a bordering fence row. Landowners also use a program where MDC matches funds allocated to them by private conservation organizations. Bee Ridge farmers used the local Quail Forever chapter's Habitat Challenge Grant. Grants are available for edge feathering, which is dropping trees to the ground to provide quail escape and loafing cover. Various cost-sharing programs help pay for timber stand improvement, such as thinning trees to encourage woodland grasses and wildflowers.

"Reimbursements vary, but those programs can reimburse farmers for significant amounts of habitat improvement costs," said John Pinkowski, an MDC private land conservationist who helped organize the Bee Ridge co-op.

Herb Wedemeier is using cost-share from a federal conservation program to convert a 7-acre corner field into native wildflowers that are important for pollinator insects such as bees and butterflies. The wildflowers are also useful to deer and birds. He took an extra step of placing downed trees at intervals in the middle of the field and along fencerows as places where quail can dodge predators.

"We figured we would do some things that made sense economically but also takes care of the critters," Wedemeier said.

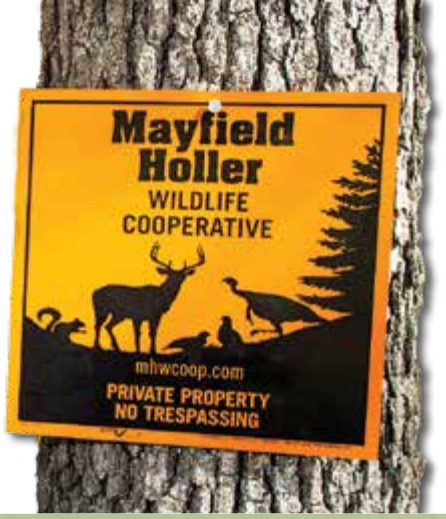
A Neighborly Strategy for Trophy Deer

Ted Slinkard is confident hunters this fall will see mature bucks with large antlers roaming the timbered Ozark hills in his Bollinger County neighborhood of southeast Missouri. Slinkard, of rural Patton, knows habitat improvements by landowners in the Mayfield Holler Wildlife Cooperative help the deer. Co-op members agreed that it's good management to pass on shooting young bucks so they can grow into large bucks. They also track deer trends on their land with photos taken by trail cameras in a two-week survey during August.

"We've been doing a trail camera survey since 2012," Slinkard said. "Last year, we had 40 cameras out with 4,000 acres under survey."

The co-op held their first meeting in 2012 after a severe drought caused a drop in the local deer

White-tailed deer



population. They've worked since then with MDC staff and experts from private conservation groups to boost their neighborhood's deer herd. Landowners who participate annually in the survey also do timber stand improvement projects to benefit trees like oaks that provide acorns, a key wildlife food. They thin timber, establish fire lines, and help each other with prescribed burns. Those steps boost grasses and wildflowers among the trees, creating more food for deer and all wildlife.

"White-tailed deer, while they seem to be our biggest focus, we're trying to do this for all wildlife," Slinkard said. "We've got a few quail hunters. Basically, it's just habitat management and trying to get everybody to work together. Last year, we did edge feathering and timber stand improvement demonstrations for people. It's for all wildlife, but mainly for deer hunting."

"One of the huge keys to success for co-ops is that local landowners need to lead it."

Bill White,
MDC Private Land Services
division chief

The deer are responding. Doe and fawn ratios are improving, helping the co-op's goal of boosting the local deer herd population. During hunting season, Slinkard values seeing bucks 3 years old or older. Their antlers are bigger and they provide more venison.

"Before, we might have had one or two shooter bucks a year," he said. "Now we have four or five a year."

Part of that success is due to communication between co-op members who hunt deer, share property lines, and share a deer herd that moves across those lines.

"When neighbors know I'll let the young deer go, they will let it go," Slinkard said. "We're starting to let the young bucks walk."

Landowners Are in Control

Co-op participation is voluntary. Landowners choose their own land management strategies, and they control access to their property.

"One of the huge keys to success for co-ops is that local landowners need to lead it," said Bill White, MDC Private Land Services division chief.

Wildlife co-ops exemplify partnerships. MDC staff members provide expertise at co-op meetings and field days. Groups like the Quality Deer Management Association (QDMA) are also active in promoting wildlife-friendly habitat and organizing landowner co-ops throughout Missouri.

"Wildlife populations are more viable when there's an interchange of genetics across a broad landscape," said Brian Towe, QDMA wildlife management specialist. Plus if weather, disease, or predator events knock a wildlife species down on one farm, healthy populations on adjoining farms can help numbers rebound.

"For wildlife populations to grow or overlap, we need connecting habitats," Towe said. "The goal with co-ops is to ensure if a quail, deer, or turkey moves to another piece of property, there's going to be food, shelter, and cover for them."

Boosting deer numbers was a primary goal when the 25 co-ops he works with organized. But many landowners are also interested in helping all wildlife. For example, the habitat work within Newton County's Bullskin Creek co-op can also help turkeys and grassland birds in Missouri's southwest corner. Grasses and forbs boosted by timber stand improvements and prescribed burns serve as deer browse. But native plants also provide nesting cover and host insects that birds feed on, especially helpful for quail raising broods in early summer.

"We've seen several co-ops where, when they started, they hadn't seen quail for a while, and now they're seeing quail," Towe said. "They get excited because they're seeing more quail, more turkeys, and more deer."

A desire for better deer hunting prompted landowners to create the Big Buffalo Creek Landowner Cooperative in west-central Missouri near Cole Camp. Achieving that goal is based on using timber management, native grass and forb restorations, and prescribed burns to create diverse food and shelter sources that help all wildlife, said Dave Niebruegge, MDC private land conservationist.

"I encourage them to restore a fully functional woodland ecosystem."

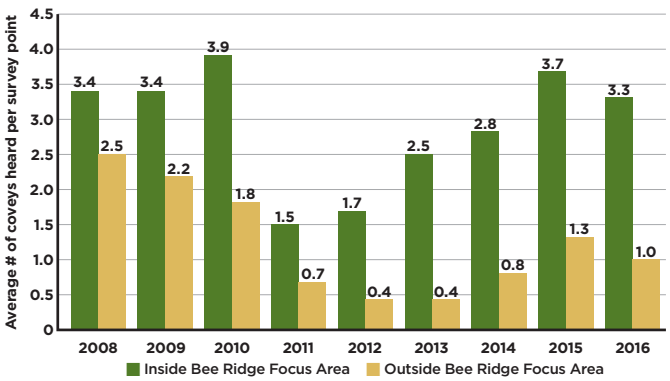
If a landowner is working to improve habitat on a farm but not getting desired results, such as more quail, the next step may be organizing a co-op among neighbors. Quail and turkeys may need room on more than one farm to rebound. But cooperation need not be complicated. Property owners in the Carroll County Quail Focus Area

in northwest Missouri simply share ideas and help each other annually with prescribed burns, said Lee Metcalf, an MDC private land conservationist who assists the co-op. Quail numbers have risen on co-op farms.

"Most of the co-ops I work with are fairly informal," said Alex Foster, a QDMA wildlife management specialist serving northern and west central Missouri. "It's just neighbors getting together."

Those gatherings lead to actions on the land that boost wildlife but also promote natural beauty, better water quality, and healthy soils. Some co-op members take extra steps to help wildlife.

Bee Ridge Quail Focus Area Fall Covey Numbers



This graph shows the power of cooperative management to help quail recover from severe weather like the 20-inch snowfall of February 2011.

In the Bee Ridge Quail Focus Area, each autumn Kevin Strange leaves a few rows of corn or soybeans as winter food for wildlife. He does little fall tillage, preferring to leave corn stubble as winter cover for critters. Green cover crops such as rye are planted in some fields during winter for soil health, livestock forage, and wildlife. He uses native grasses while resting crop fields in the federal USDA/CRP program. Quail and deer benefit, and so do neighbors who value wildlife.

Last winter, a season often challenging for wildlife, he stepped out of his country church early one evening and heard two quail coveys calling to one another from Bee Ridge fields. He knew good habitat would carry them through to this summer's nesting season.

"I think there's room for the farming and the wildlife," Strange said. ▲

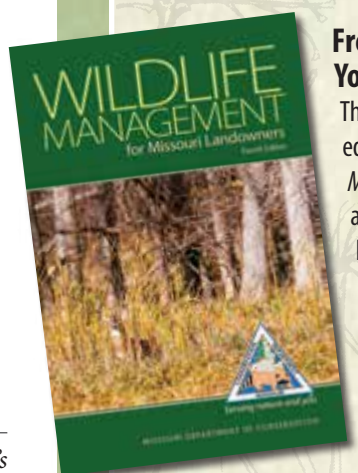
***Bill Graham** is MDC's Kansas City Region media specialist. He's a lifelong hunter, angler, and camper who also greatly enjoys hiking and photography in Missouri's best wild places.*

Ted Slinkard is a landowner and organizer of the Mayfield Holler Wildlife Cooperative in Bollinger County.

Start a Wildlife Cooperative

Landowner wildlife cooperatives offer the advantage of pooling expertise and resources to help property owners achieve their wildlife management goals. MDC assists property owners with wildlife habitat improvements. Staff can recommend strategies and connect landowners with loaner equipment or financial resources to make improvements. For assistance, contact your local MDC office or visit **mdc.mo.gov/property**.

For help from the Quality Deer Management Association in forming a landowner wildlife cooperative, call Brian Towe at 573-397-1664 or Alex Foster at 660-605-0501.



Free Publication Helps You Help Habitat

The deeply revised, full-color 2017 edition of *Wildlife Management for Missouri Landowners* provides new and updated information on the latest in wildlife habitat management techniques. To order your free copy, email the publication title and your mailing address to **pubstaff@mdc.mo.gov**, or call 573-751-4115, ext. 3630.

PURPLE LILLIPUT

Missouri's Essential Freshwater MUSSELS

Appreciating and conserving nature's living water filters

BY STEPHEN E. McMURRAY

Over 300 species of freshwater mussels, also known as clams, naiades, or bivalves, occur in North America, and 69 of these can be found in Missouri. The iridescent whites, brilliant purples, and beautiful pinks of the inner lining of their shells are as colorful as some of their common names — threehorn wartyback, pimpleback, elephantear, rabbitsfoot, spectaclecase, elktoe, and snuffbox. They range in size from the diminutive and aptly named purple lilliput (think Lilliputians from *Gulliver's Travels*), which reaches a maximum size of only about 2 inches, to the washboard, which can reach a maximum size of 10 inches or more. These unique animals can live for just a few years or up to 100 years or more, often staying in the exact same spot their entire lives.

Is it a Mussel or a Clam?

Both mussels and clams are bivalve mollusks — aquatic members of the invertebrate phylum of animals that have a soft body usually enclosed in a shell. Other mollusks include snails, slugs, and octopuses. *Bivalve* means that they have two shells that are hinged together. In salt water, mussels attach to hard structures like other shells, rocks, or piers, and clams burrow into the sand or substrate. Even though native freshwater bivalves don't attach to hard substrates as adults, many species do produce what is called a *byssal* thread that they can attach to hard substrates as juveniles. The name "freshwater mussel" or just "mussel" has long been used for them.

Name That Mussel

1. Black sandshell
2. Monkeyface
3. Mucket
4. Pimpleback
5. Plain pocketbook
6. Purple wartyback
7. Threehorn wartyback
8. Threeridge
9. Wabash pigtoe

DAVID STONNER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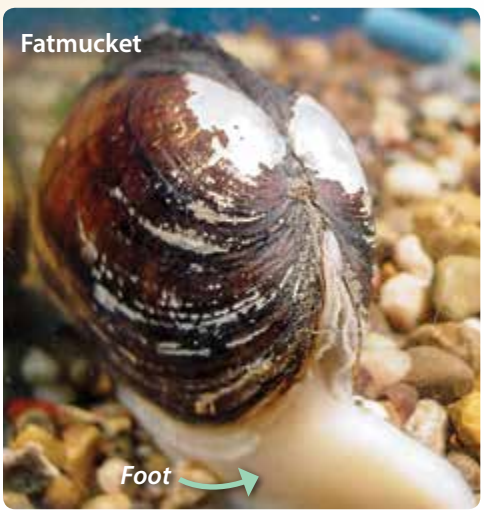
MISSOURI

is home to some of the best remaining populations of **rare mussel species** in the country.

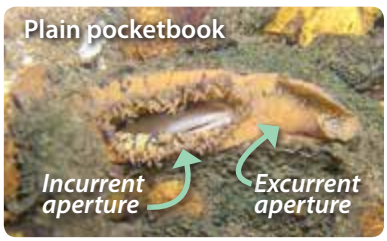


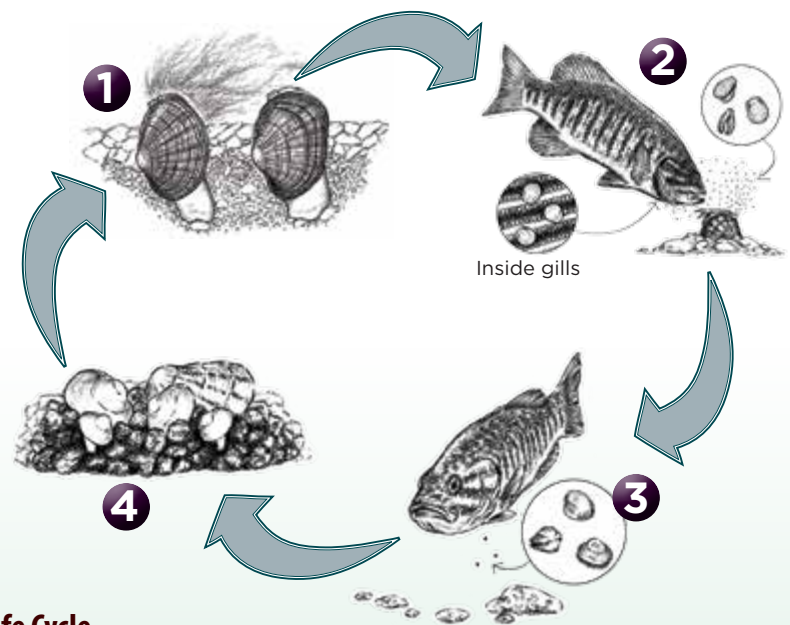
Range and Diversity

Freshwater mussels live on the bottom of rivers and lakes. They occur throughout Missouri — from the ditches in the Bootheel to the clear waters of the Ozarks to the still waters of some of our state's lakes. Some species are widespread and found in most permanent bodies of water. Many species are found in greatest numbers in river reaches with specific physical and geological characteristics. Some of our rarest species are only found in a few locations in the state, and some of the best remaining populations of rare species are found in Missouri. As a general rule, larger rivers and streams support more species than smaller creeks. The most diverse mussel assemblages in the state are found in our clear, flowing Ozark rivers — the Gasconade, Meramec, and Osage.

Feeding and Reproduction

Inside the shell, the stomach, heart, and kidney are found in the visceral mass directly above a long muscular mass called the "foot." This is where the intestines and gonads are found. Even though mussels don't walk, the foot is used for locomotion and helps to anchor the animal in the stream bottom. The foot withdraws into the shell if the animal is pulled from the stream bottom. Above the foot on each side are pairs of thin, specialized gills that allow the mussel to respire and filter-feed. Water is pumped through two openings (known as apertures) at the posterior end, entering the lower opening and exiting the upper one. The gills extract oxygen and divert food such as bacteria, algae, and plankton to the stomach. Sediment, undigested food, and wastes are expelled in a mucous packet known as *pseudofeces* (sue-doe-fee´-sees), becoming food for other aquatic animals like insects and fish.

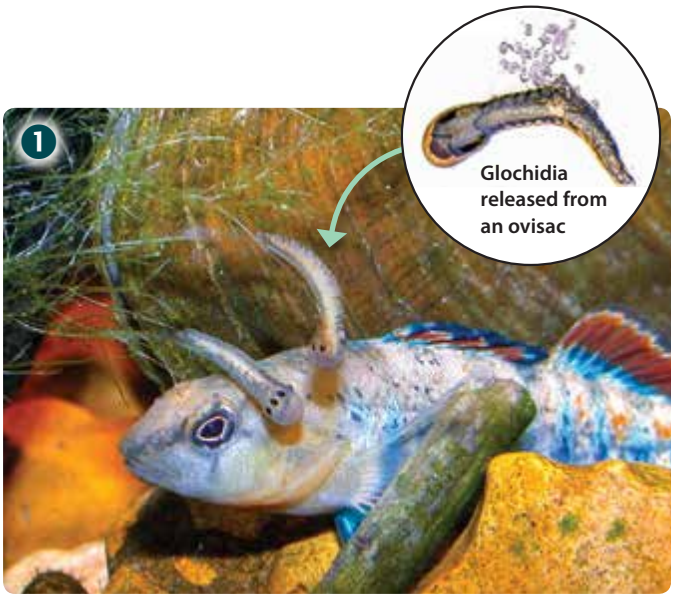


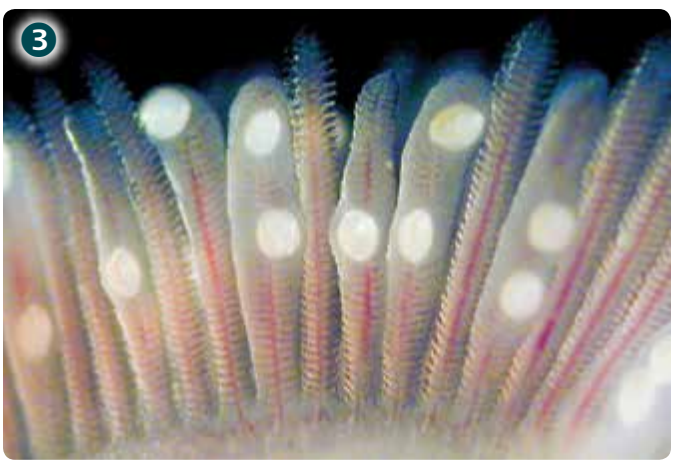


Life Cycle

1. Males release sperm into water. Females filter the sperm into their gill chambers where the eggs are fertilized, and develop into tiny larvae called glochidia.
2. Glochidia lack internal organs and must attach to the gills or fins of a specific host to develop. Some mussels must trick the host into biting or inhaling the glochidia, using lures resembling small fish, insects, or other prey items of the host.
3. When developed, juvenile mussels separate from the host and drop to the stream bottom. Although parasitic, glochidia usually do not harm their host.
4. If the juvenile mussels drop into good habitat, their chances for survival are much greater, enabling them to reach adulthood and reproduce.

ILLUSTRATIONS AND PHOTOGRAPHS: SCOTT FAIMAN





PHOTOGRAPHS COURTESY OF DR. CHRIS BARNHART

❶ The ovisacs of a kidneyshell mussel lure an orangethroat darter, a potential host fish. ❷ Plain pocketbook "fish" lure ❸ Glochidia on fish gills ❹ Juveniles after release from host fish

Freshwater mussels have a complex, interesting, and unique life cycle. Males release sperm into the water and these enter the female through the incurrent aperture. Once the eggs are fertilized, her modified gills act as brooding chambers for embryos that mature into microscopic larvae, called *glochidia* (glow-kid´-ee-ah). The glochidia must attach to a host, typically a fish. Unlike parasites, glochidia usually do not harm the host. Different mussels have evolved unusual tricks to attract their host. Some species release their glochidia in ovisacs that resemble the host fish's food, while other mussels have special "lures" to draw a fish close. For example, the female plain pocketbook mimics a minnow to lure in unsuspecting bass. The bass attempts to eat the "minnow" and instead gets a mouthful of glochidia! The snuffbox actually captures its unsuspecting host, a darter called the logperch, and closes its shell around the head of the fish, pumping its glochidia into the fish's mouth. Some mussels are quite particular about which host they use, while others can use several different species of fish.

The number of glochidia released by each female mussel varies by species. Some release up to SEVERAL *hundred thousand.*

Some mussels have only **ONE** known fish species that hosts their glochidia.

Generally, glochidia stay attached to their host fish for **2–4 WEEKS.**

Eye-Popping Acts of Reproduction Right Under Your Canoe

To reproduce, some mussels must trick a fish into "hosting" their larvae until they can drop off and live on their own. Watch mussels using a built-in line and lure to attract host fish at **short.mdc.mo.gov/Zwn**. Browse more amazing videos and photos of Missouri's freshwater mussels at Unio Gallery, published by Dr. Chris Barnhart, Missouri State University. Find it at **unionid.missouristate.edu**.

Important to Nature and People

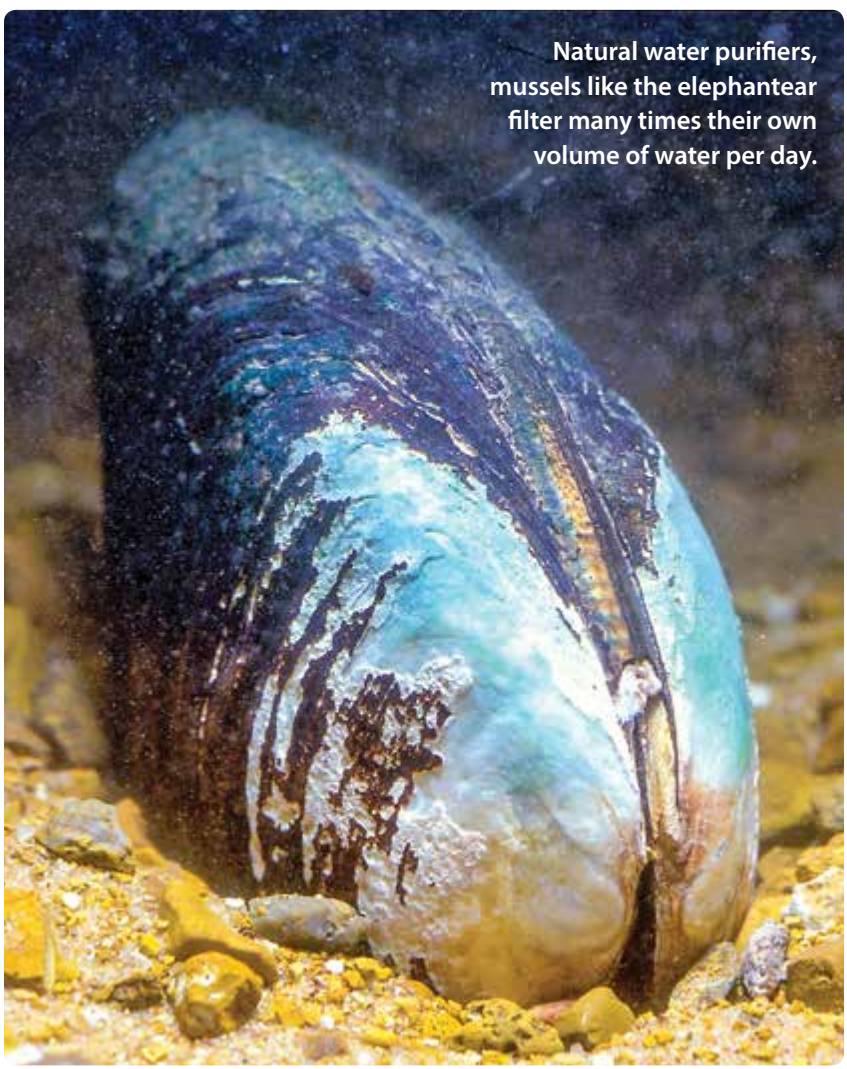
Often overlooked, freshwater mussels play a number of valuable roles. In nature, they are an important food for raccoons, mink, otters, and some waterfowl, fish, and crayfish. Muskrats may survive on freshwater mussels during winter months, leaving large piles of shells known as *middens* on stream banks. Often, they are good at finding small, obscure species that are difficult for researchers to locate. Fish, such as freshwater drum and catfish, consume mussels and snails, often crushing the shells in the process. In addition to being a food source, freshwater mussels create habitat characteristics that benefit many different species of fish, crayfish, and aquatic insects. Often the diversity of other aquatic animals is higher in mussel beds, areas dense with individual mussels, often of different species.

Freshwater mussels are important to humans, too. Native Americans relied on mussel meat as part of their diet. They shaped mussel shells into tools, utensils, and jewelry. They also left behind middens. These can still be found at some archeological sites and on the banks of some rivers, helping archeologists better understand Native American culture and way of life.

In the late 1800s, a German immigrant started a pearl button industry on the banks of the Mississippi River using freshwater mussel shells as raw material. Many other rivers were also rich in mussels, and camps quickly sprung up near mussel beds. The industry stretched throughout the Mississippi River Basin as far west as Kansas, with Muscatine, Iowa, being named the "pearl button capital of the world." Here in Missouri, button factories opened in Mississippi River towns like Hannibal and Louisiana. Eventually, pollution and overharvest reduced the mussel beds, and the pearl button industry largely came to an end with the introduction of plastic buttons. It was soon discovered, however, that freshwater mussel shell material made good seeds for cultured pearls, and that industry still exists today. The commercial harvest of freshwater mussels closed in Missouri in 2009.

Sentinels of Danger

Scientists refer to freshwater mussels as sentinel species that can warn when danger appears in the environment. You could say our freshwater mussels are like the canaries miners once kept in coalmines to warn them when dangerous gases like carbon monoxide were present. If a canary died, the miners knew they were in danger, too. Because mussels are sensitive to various pollutants, long-lived, and often remain in one place their entire lives, their presence is often a sign of a healthy river or stream. Mussels can also accumulate pollutants from the environment. Scientifically analyzing them helps us determine what pollutants are affecting our rivers.



Natural water purifiers, mussels like the elephantear filter many times their own volume of water per day.

PEARL BUTTONS: DAVID STONNER; ELEPHANTEAR: JIM RATHERT

Disappearing and Imperiled

Freshwater mussels are disappearing at an alarming rate throughout North America, where scientists consider over 70 percent of all mussel species to be imperiled. Nearly half of Missouri's mussels are species of conservation concern, ranking them second only to crayfish as one of the most endangered animal groups in the state. Many of these species of concern — 15 — are today considered to be endangered or threatened at the state or federal level, and others are being considered for listing. The survival of these species in Missouri is sadly uncertain. Dams, gravel mining, pollution, water shortages, and competition from nonnative bivalve species like the Asian clam and zebra mussel are some of the primary reasons for decline. In addition, new invaders, including fish like the black carp and the round goby, could soon invade Missouri rivers. There are also mysterious declines where a stream has lost nearly its entire mussel fauna but still has a healthy assemblage of fish, crayfish, and aquatic insects. These enigmatic disappearances are perplexing because they often aren't associated with any direct, visible cause.

Mussels rank as the second-most endangered animal species group in Missouri.

WINGED MAPLELEAF
(FEDERAL ENDANGERED, STATE ENDANGERED, AND SPECIES OF CONSERVATION CONCERN)

69 mussel species live *in* Missouri

NEARLY HALF
of Missouri's mussels are
species of conservation concern

15 Missouri species are listed as state or federally **threatened *or* endangered**

Nonnative INVADERS

ASIAN CLAM

ZEBRA MUSSELS

WINGED MAPLELEAF: DAVID STONNER; ZEBRA MUSSELS: MDC FILE; ASIAN CLAMS: U.S. GEOLOGICAL SURVEY, BUGWOOD.ORG

Boost Mussel Power Where You Live

- Avoid damming tributaries and streams.
- Don't mine gravel.
- Keep chemicals, sewage, animal waste, and trash out of streams.
- Conserve water.
- Stop alien invasions – don't dump bait.
- Clean your boat and fishing gear between trips.
- Start or join a Stream Team at **mostreamteam.org**.

MISSOURI STREAM TEAM

Restoration Efforts Needed

Habitat restoration is a key element needed to bring Missouri's mussel populations back to healthy, self-sustaining levels. Restoration of streams is a slow process. Mussels need a stable habitat of rocks, sand, cobble, or boulders for securing themselves in their sometimes-turbulent environment. Artificially propagating mussels in hatcheries may save some of our rarest mussel species and provide specimens for biological and toxicological research.

In addition to better habitat, freshwater mussels need cleaner water. Stricter controls on pollutants, better understanding of which pollutants affect mussels, and collaboration between industries and private landowners to prevent water pollution will help Missouri's freshwater mussels recover. In 1949 Aldo Leopold, the father of modern wildlife management, wrote, "To keep every cog and wheel is the first precaution of intelligent tinkering." Nearly every conservation story follows this quote as its guidepost — why do we work to save these species?

We know a little about the role mussels play in their ecosystem, but certainly they contribute much more than we know.

Stephen McMurray (right) and Scott Faiman conduct surveys to help document the distribution of mussels and monitor rare species.

Research for Better Understanding

The Missouri Department of Conservation and other partners have been working for decades to understand the distribution, ecology, and threats facing freshwater mussels. MDC staff surveys rivers in the state to document where species occur and monitor rare species that might be affected by development or other human disturbances. These occurrences are tracked in the Missouri Natural Heritage Program Database. This database was created in 1981 to inventory and rank rare species in the state, and it is used for environmental review and project planning purposes.

Researchers from Missouri State University, the U.S. Fish and Wildlife Service, and MDC have worked cooperatively to develop methods to artificially culture freshwater mussels in a laboratory or hatchery. We hope that if we can determine why mussels were lost from streams in the state and abate the threat, we can then restore a stream's mussel fauna.

Since the 1970s and 1980s, mussel surveys have shown SIGNIFICANT RATES OF LOSS in the Meramec, Salt, and James river basins.

DAVID STONNER

Scientists with the U.S. Geological Survey's Columbia Environmental Research Center have worked to develop standardized methods to use freshwater mussels in toxicological research. These can be used to help us understand what chemicals or pollutants are affecting mussels and, more importantly, what water-quality standards should be established to protect our rivers and the organisms that live in them for future generations of Missourians to use and enjoy.

Recently, MDC has partnered with the U.S. Geological Survey's Fish and Wildlife Cooperative Research Unit at the University of Missouri to use geographic information system tools to help us predict where in the state mussel beds occur and identify threats to mussel populations. Partners will incorporate these data into a design for a statewide monitoring program that will help us better understand, protect, and conserve these important animals and their habitat. ▲

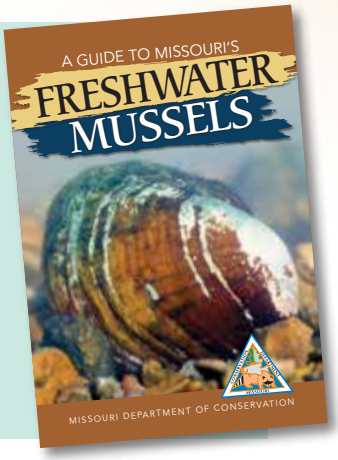
Resource Scientist ***Stephen E. McMurray*** *is the state malacologist. He lives in Columbia, where he tries to fish (lose lures) and spend time outdoors with his family as much as possible.*

80 Years of Conservation

MDC started mussel research in the late 1970s. At that time, a malacologist was hired to survey mussels in the Meramec River basin as part of an effort to ensure the preservation of the pink mucket, a federally endangered species that occurrs there. Since that time, Missouri has been one of a few states to employ a staff person dedicated to mussel research.

Learn More

If you live in Missouri, you can request a free copy of *A Guide to Missouri's Freshwater Mussels*. Email the title and your mailing address to **pubstaff@mdc.mo.gov**, or call 573-751-4115, ext. 3630. Can't wait for the book to arrive? Browse freshwater mussel entries in our online *Field Guide* at **mdc.mo.gov/field-guide**.



The most diverse mussel assemblages in Missouri are found in our clear, flowing Ozark rivers.

NOPPADOL PAOTHONG

BOW BUILDERS

Making your own archery equipment is easier than you think, and a whole lot of fun!

BY DARREN HAVERSTICK
PHOTOGRAPHS BY CLIFF WHITE

I ALWAYS WANTED TO CRAFT A BOW WITH MY OWN two hands, but I was intimidated by the time, talent, and money it takes. When I first came across the plans for this PVC bow, I thought it was too good to be true. Here was a functional piece of archery equipment, which any child would enjoy, that I could build with tools I already own. And to make it even better, the building process required little or no skill, which is a good thing because I have none whatsoever.

Give me a computer and some high-end modeling software and I can create for you a handyman's masterpiece. Give me the drawings of said masterpiece and a saw, and I can create for you a pile of sawdust and some appendages that need to be sewn back on. I am happy to report that as of this writing, all my fingers are intact and I have successfully made several of these plastic pipe wonders.

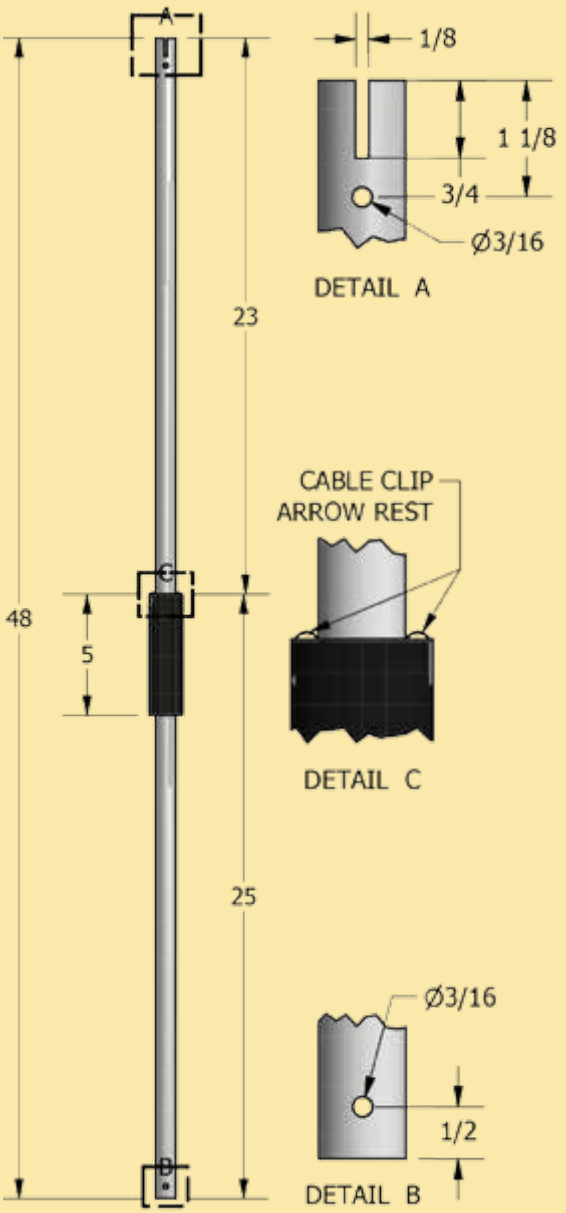
Here are the steps to create one of your own. The design is simple, the cost is cheap — about $2 a bow — and the end product is a real bow with a draw weight between 15–20 pounds. This is a great project for any 4-H club or Cub Scout pack and will introduce kids to the fun of archery without breaking the bank.

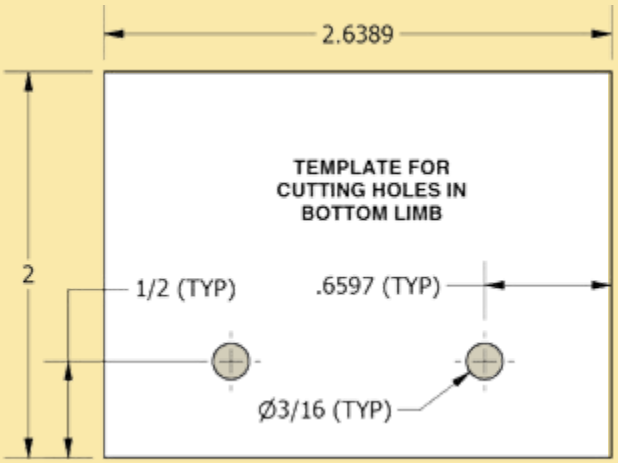
I use PVC SCH 40 pipe because it's inexpensive, around $1.70 for a 10-foot piece, and easy to find. It also has just the right amount of stiffness for a kid's bow — the finished product will pull around 15 pounds. However, if you do find the bow is too easy for your child to draw, you can stiffen it up by filling it with expandable foam insulation.

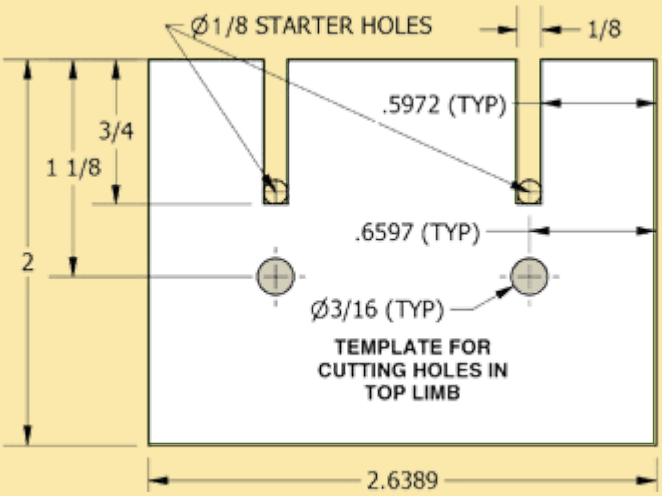
A set of free detailed plans for this bow can be downloaded at **unitedbowhunters.com/about-ubm**. Click on "PVC Pipe Bow Plans." I strongly suggest you download the plans before beginning this project.

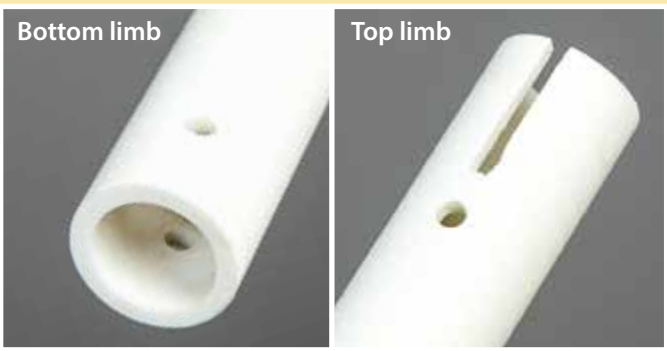
MATERIALS NEEDED FOR THIS PROJECT

- ½-inch PVC pipe
- acetone and steel wool
- ½-inch foam pipe insulation
- small plastic zip ties and glue
- ¼-inch coaxial cable clips
- electrical tape
- #48 braided nylon line
- spray paint









It is essential that the holes and slots for the bowstring are centered and aligned on the PVC pipe so the bow won't twist when it is strung.

To start, cut a 48-inch piece of pipe with a hacksaw and sand the edges smooth. If you are going to paint the bow, you will need to remove all the writing from the outside of the pipe. Acetone works well for this, but make sure you do it in a well-ventilated area.

Once the pipe section is clean, you are ready to start drilling holes and cutting slots for the string. First, stand the pipe upright on the floor and look down its length from the top end. The pipe most likely will have a bend to it and you want to align this bend so the bowed section faces directly toward you and both ends point away from you. In this position, the inside face of the pipe will be the belly of the bow and the outside face will be its back.

The reason for this orientation is to give the bow more strength. If you look at an unstrung recurve bow's limbs, you will see the tips curve away from the person holding it. That "recurve" helps the bow store more energy in its limbs.

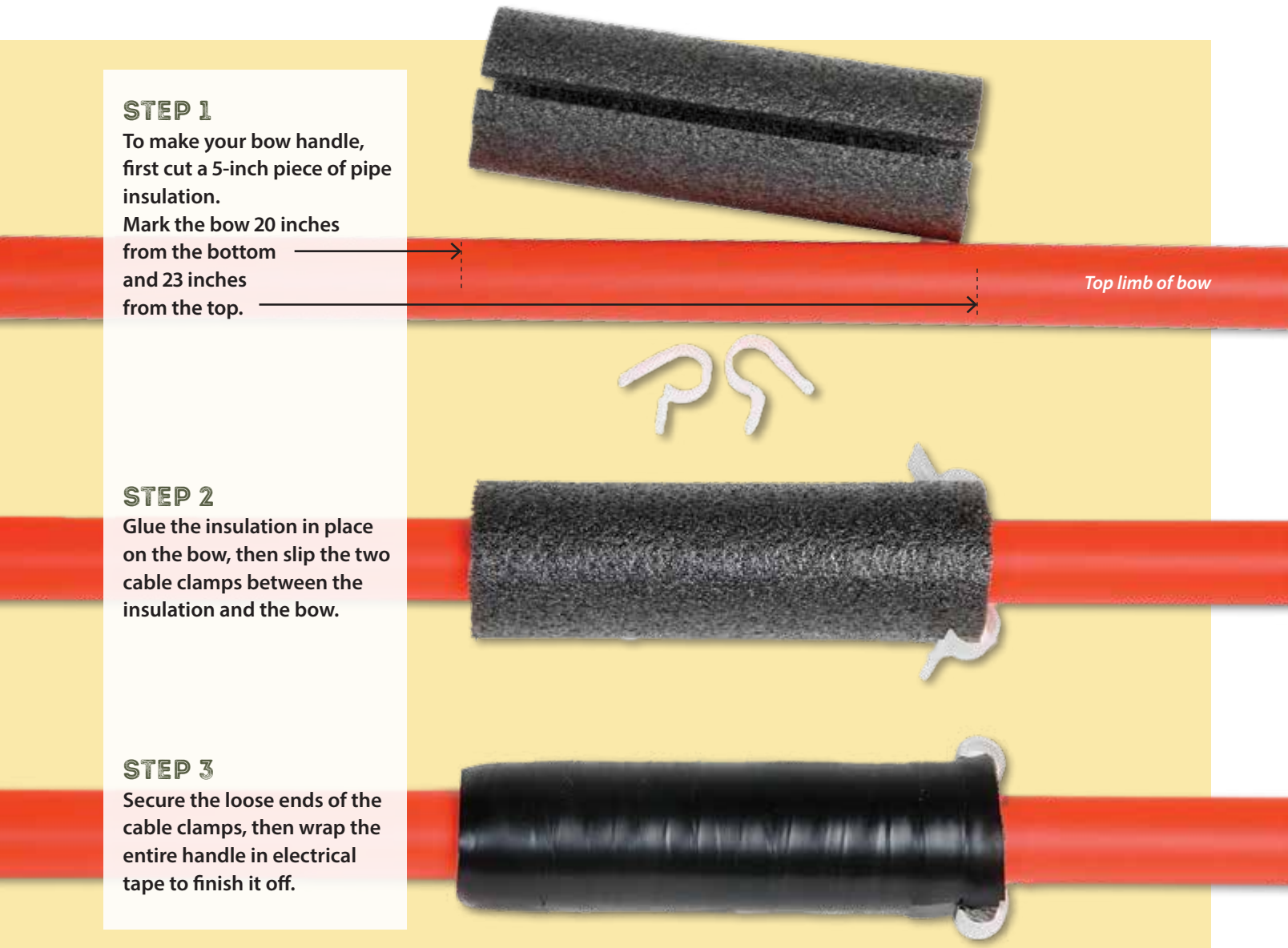
Drill a 3/16-inch hole through the pipe, back to belly, at both ends to pass the bowstring through. It is very important that these holes are properly aligned so the limbs are not twisted when the bow is strung. This is easily accomplished if you have access to a drill press and a vice. However, if you are like me and only have a hand drill, then the process becomes a bit more challenging. The online plans have a template you can cut out and tape around the pipe to facilitate this task. If you decide to do it the hard way, with just a measuring tape and a pencil, make sure you check your measurements a couple of times before drilling and cutting. The materials may be cheap, but your time is not, and you don't want to waste any of it.

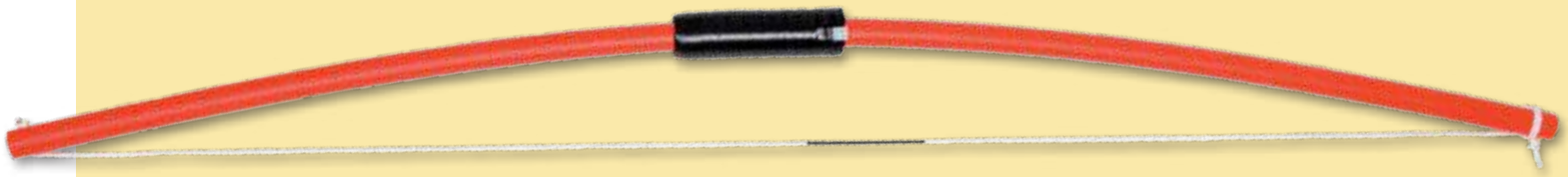
After the holes are drilled for the bowstring, you are ready to cut the 1/8-inch by 3/4-inch slots in the top limb. These will be used to secure the bowstring in place once you have the bow strung to the desired brace height. I have found the slots are easier to cut if you first drill a 1/8-inch hole in the bottom of each slot. Then you can use a hacksaw and a utility knife to cut the rest of the material out. A Dremel rotary tool is also very handy for this task. Finally, clean up the slot with a metal file.

Archery is a lifetime sport that introduces children and their families to the outdoors. The department established the Missouri National Archery in the Schools Program (MoNASP) in 2002, and it has grown tremendously. It is now in 620 Missouri schools with 185,000 students in grades 4–12 participating.

To prepare the bow for painting, sand it with steel wool and then clean it off with acetone again. Kids seem to love the bows in fluorescent colors, and I like to do mine in a candy cane pattern. I choose two colors and spray paint the bow completely in the lighter of the two colors. After the paint is thoroughly dry, I take 1-inch-wide masking tape and start wrapping it around the bow in a spiral fashion, starting at one end and going to the other. Then I completely repaint the bow using the darker color. When that coat is dry, I remove the masking tape to reveal the candy cane effect.

Now you are ready to put the handle and arrow rests on the bow. Cut off a 5-inch piece of foam pipe insulation. Make a mark on the bow 23 inches from the top limb and 20 inches from the bottom limb. This marks the top and bottom placement of the handle. Take some glue and smear it on the bow between the two marks and put the insulation in place. It doesn't matter where the seam is located since the insulation will be covered in electrical tape. With the belly of the bow facing toward you, take a cable clip and slip the straight "ear" in between the insulation and the left side of the bow. Do the same with another cable clip on the bow's right side. Make sure the clips line up with one another and the center of the bow. Secure them in place by looping a zip tie around the handle and tightening it down on the exposed "ears." Take another zip tie and tighten it around the bottom of the insulation in the same manner. Cut off the ties' excess and proceed to wrap the entire handle in electrical tape.





Tie a knot at one end of the string and thread through the bottom limb to begin stringing the bow.

Slide the heat shrink tubing into location. Carefully heat the tubing, taking care not to melt the string.

Tie a knot at the other end of the string. Bend the bow and wrap the excess around and through the slot.

This particular bow's design has the bowstring permanently attached, so you won't have to worry about it getting lost. Cut off a 54-inch piece of #48 braided cord and use a lighter to melt the ends to keep the piece from fraying. With a small knot tied in one end, thread the string back-to-belly through the bottom limb and then thread the string through the top limb in the opposite direction — belly to back. Without bending the bow, pull the string taut and tie another knot as close as you can to where the string comes out of the back of the top limb. This will keep the string from coming off the bow.

To string the bow, brace the bottom limb against the arch of your foot and bend the bow to the desired brace height, about 6 inches. With the bow in this position, pull the string taut and wrap the excess around the top limb while passing it through the slot. The knot you tied in the top end of the string will get caught in the slot and keep the bowstring from unwinding.

One thing you will want to add to the string before using the bow is some serving to hold an arrow nock snugly. An easy way to do this is to use a piece of 3/16-inch diameter heat shrink tubing about 4 inches long. String the bow to its proper brace height and mark on the string where you want one end of the tubing to go. Now unstring the bow and untie the knot at one end so you can slide the tubing over the string. Move the tubing to the marked spot, apply some heat, and you have served your string. With the string still untied from the bow, measure from its free end to the end of the tubing and write that measurement down for future reference. That way you can place the tubing on other bowstrings without stringing up each bow beforehand.

I get a tremendous amount of satisfaction from building these simple, yet effective, arrow flingers. The smile on a young person's face as they shoot a bow they helped make only adds to that feeling. So go out, gather up the kids in the neighborhood, and start becoming bowyers. It took me a lot of words to describe this process, but it's a fairly simple one that takes less than an hour to complete, not counting the paint drying time. It's cheap entertainment, it gets children off the couch and involved in outdoor activities, and, most of all, it's fun. ▲

When he's not writing software or solving some high-tech computer problem, ***Darren Haverstick*** *can be found hunting game with primitive weapons at his family farm in northern Shannon County. He currently resides near Fair Grove with his family and a pack of hounds.*

Viceroy

IN THE NATURAL world, animals learn not only to survive, but also to adapt to a wide range of habitats and their surrounding environment. This incredible capability allows them to evolve over time. One way is through mimicry — a similarity between species often to take advantage of the other's merits.

Like many people, I can't wait for butterflies to return in the summer. For the past few years, I have been trying to learn more about the habitat requirements for these flying jewels and how to correctly identify them. However, viceroys have fooled me more than once. These butterflies, masters of mimicry, look just like monarchs to an untrained observer. So how can you be sure which species you're seeing?

The viceroy (*Limenitis archippus*) is a North American butterfly that ranges through most of the contiguous United States as well as parts of Canada and Mexico. They are normally found in moist areas where willows grow. Considered a monarch look-alike, viceroy butterflies in the north are more orange, similar to monarch butterflies. In the south, they are more rusty in color, similar to queen butterflies.

The key difference between viceroys and monarchs is their size, although this may be difficult to see in the field. Viceroy wings span 2½–3⅜ inches compared to monarch's 3⅜–4⅞ inches. The wing pattern and coloring of a monarch and viceroy are nearly identical. However, a viceroy has a black line that runs across its hind wing. Viceroys fly much faster and more erraticly than a monarch's smooth, float-like flight.

Viceroys do not migrate. The larvae, which resemble bird droppings, overwinter rolled up in a leaf of their host plant. In the spring, the larvae need about 15 days to complete their life cycle and become a butterfly. Host plants for viceroy butterflies include willow, poplars, and cottonwoods. Females lay eggs on the tips of leaves, and hatchling caterpillars eat the leaves from the tip. Caterpillars range in color from olive green to brown, and they grow over 2,500 times their size from birth before they pupate.

The viceroy's major defense against predators is mimicry. Birds that have not been exposed to monarchs willingly eat viceroys, but those that have tasted the unpalatable monarch refuse to touch the mimic.

Butterflies are important pollinators. To help these flying jewels, plant a variety of native flowers. Your garden will be a hotbed of butterfly activity.

—Story and photograph by Noppadol Paothong

(viceroy) 100mm macro lens f/4 • 1/1250 sec • ISO 200
(monarch) 20mm lens • f/5.6 • 1/800 sec • ISO 400

Viceroy

Monarch butterfly

80 Years of Conservation

The drastic decline of the monarch spurred action in Missouri and across the U.S. The department is working with Missourians for Monarchs, a collaboration of more than 30 agencies and organizations, committed to creating and maintaining 19,000 acres of pollinator habitat annually for the next 20 years.

We help people discover nature through our online *Field Guide*. Visit **mdc.mo.gov/field-guide** to learn more about Missouri's plants and animals.

Thomas Hill Reservoir Conservation Area

This area in Macon and Randolph counties offers something for every outdoor enthusiast, no matter the time of year.

16–35mm lens • f/5.6 • 1/80 sec • ISO 400 | by David Stonner

SINCE 1965, the department has had a lease agreement with Associated Electric Cooperative Inc. to manage the land and water surrounding the Thomas Hill Energy Center to benefit fish, forests, and wildlife and for public enjoyment.

Thomas Hill Reservoir Conservation Area (CA) offers over 9,300 acres and many ways for the public to connect with nature. Swimming, skiing, and fishing are all welcome on the 4,950-acre Thomas Hill Reservoir, which is easily accessible from any of the three concrete boat ramps. During the winter months when all other bodies of water are frozen solid, heated water discharged from the power plant turbines offers a unique fishing opportunities for hybrid striped bass and other fish species. Other amenities available to anglers include a fish-cleaning station, a disabled-accessible fishing jetty and dock, and two other courtesy docks.

For those interested in getting outside and spending time in nature, there are 20 designated primitive campsites on the area with fire rings. The sites are free and available on a first-come, first-served basis. Picnic shelters with tables are also a popular attraction during the summer and fall months.

The diverse habitats surrounding the lake are home to many wildlife species. The area is designated as one of the Department's Quail Emphasis Areas, and management practices are aimed at benefiting quail and other small game. Prescribed burning, woodland management, and food and cover plots are a few tools the department uses to maintain and grow these small game populations and benefit all wildlife. Deer and turkey hunting are popular on the area as well as waterfowl hunting. Bird-watching is also a popular activity during the fall and spring migration periods because the lake serves as home to a variety of water birds.

The uplands are dominated by warm season grasses, shrub thickets, and woodlands, while the bottomlands near the lake are dominated by forest and seasonal wetlands.

The next time you want to connect with nature, no matter the season, give Thomas Hill Reservoir CA a try.

—Chad Smith, area manager

Thomas Hill Reservoir Conservation Area

Recreation Opportunities: Hunting, wildlife and bird viewing, nature photography, camping, fishing, swimming

Unique Features: 4,950-acre reservoir, winter fishing, campsite, picnic area, seasonal wetlands

For More Information: Call 660-785-2420 or visit **short.mdc.mo.gov/ZwH**

80 Years of Conservation

In the early 1930s, Missouri had little unspoiled public land available for hunting, fishing, hiking, wildlife watching, and other outdoor activities. Through ongoing, dedicated efforts of conservation-minded Missourians, 80 years later, we now offer nearly 1,000 conservation areas across the state to explore.

MDC

DISCOVER nature

7 IDEAS FOR FAMILY FUN

To find more events near you, call your regional office (phone numbers on Page 3), or visit **mdc.mo.gov** and choose your region.

CATFISHING KANSAS CITY

JUNE 8 • THURSDAY • 6–9 P.M.

Kansas City Region, Parma Woods Shooting Range, 15900 NW River Road, Kansas City, MO 64153

Registration required, call 816-891-9941 by June 7

Ages 11 and older

Catfish are Missouri's most sought-after fish. Whether you are a seasoned catfish angler or a novice, you will benefit from this course as we discuss when, where, why, and how to fish for this whiskered wonder.

ADVENTURE BIRDING/ HALF-DAY DISCOVERY HIKE: BIRDS AND BLOOMS

JUNE 10 • SATURDAY • 7 A.M.–12:30 P.M.

Central Region, Runge Conservation Nature Center, 330 Commerce Drive, Jefferson City, MO 65109

Registration required, call 573-526-5544

Ages 11 and older, children must be accompanied by an adult

Ha Ha Tonka State Park is one of the birding hotspots on the new Great Missouri Birding Trail, and it is often ablaze with wildflowers. We are going to hike and bird along the 2.5-mile rugged Dolomite Trail. Hopefully, we will find numerous wildflowers and birds, including prairie warblers and yellow-breasted chats. Bring a lunch, water, snacks, sunscreen, and insect repellent. Wear sturdy shoes, dress for the weather, and bring your binoculars or borrow a pair of ours. Meet at Runge. Transportation provided.

YOUTH POND CATFISHING

JUNE 10 • SATURDAY • 10 A.M.–NOON

Southeast Region, Cape Girardeau Conservation Nature Center, 2289 County Park Drive, Cape Girardeau, MO 63701

Registration required, call 573-290-5218 beginning June 1

Ages 7–15, accompanied by an adult

Learn about the life cycle, habitat, and preferred diet of the native catfish species in Missouri. Basic tackle, equipment, and fishing techniques for catfishing will be discussed. There will be fishing at the Kids' Fishing Pond after instruction.

BEE BATH

JUNE 21 • WEDNESDAY • NOON–2 P.M.

St. Louis Region, August A. Busch Memorial Conservation Area, Hwy. D, St. Charles, MO 63304

Registration required, call 636-441-4554 beginning June 5

All ages, families

You have heard of bird baths, but have you ever heard of a bee bath? Learn about bees, why they are important, and what you can do to help them. Participants will be able to make their own bee bath to take home. We will be working with acrylic paint so bring a smock or clothes that can be ruined.

DISCOVER NATURE: YOU CERTAINLY CAN, CAN

JUNE 24 • SATURDAY • 10 A.M.–2 P.M.

Ozark Region, Twin Pines Conservation Education Center, RT 1, Box 1998, Winona, MO 65588

Registration required, call 573-325-1381 by June 16

Ages 16 and older

Nature produces an abundance of foods, each in its own season. Enjoy what you pick and hunt, not just when it's that time of year, but throughout the year by learning how to preserve that bounty. The Twin Pines staff will show you the basics.

FAMILY TRAP SHOOTING

JUNE 25 • SUNDAY • 9–11:30 A.M.

Northwest Region, Lake City Range, 28505 E. Truman Road, Buckner, MO 64016

Registration required, call 816-249-3194 by June 17

Ages 12 and older

Trapshooting is a fun sport to experience and a good way for an upland game hunter to improve their skills. This course will cover basic firearm safety, different actions on shotguns, proper shot size, proper firearm fit, and shot follow-through.

TROUT FISHING FOR WOMEN

JUNE 30 • FRIDAY • 9 A.M.–2 P.M.

Southwest Region, Springfield Conservation Nature Center, 4601 S. Nature Center Way, Springfield, MO 65804

Registration required, call 417-888-4237

Women ages 17 and older

Meet at Roaring River Hatchery for an introduction to trout fishing. Learn how to catch, clean, and cook trout. All spin-cast equipment will be provided, and fishing permit and daily trout fishing tag requirements are waived for this program.

Subscribe online • mdc.mo.gov/conmag • Free to Missouri households

I Am Conservation

MDC was founded 80 years ago through the efforts of citizen conservationists, and it has thrived for so long due, in large part, to their involvement. Nels Holmberg is a perfect example. After a 32-year career in medical research, Holmberg went back to college to study plant biology. "In 1984, when my wife bought a farm, I wandered around asking myself, 'What is all this stuff growing here?'" said Holmberg. "This led to me joining the Missouri Native Plant Society and the Webster Groves Nature Study Society, which led to me quitting work and going back to school." Since then, Holmberg has contributed his time and expertise to several projects for both MDC and the Missouri Botanical Garden Flora of Missouri project. "To date, I have added 4,460 specimen to the Missouri Botanical Garden herbariums," said Holmberg. His work with MDC began in 2003 when Tim Smith, the state botanist at the time, "asked if I would search for rare plants not seen for at least 40 years," said Holmberg, who continues to work with MDC on various plant inventory projects. "I think understanding and preserving the living things on this earth is the highest calling of a biologist," said Holmberg, "and it gives me great happiness and satisfaction. Ideally, I would love to learn all the insects, fungi, lichens, etc., but life seems to be too short." *—photograph by David Stonner*